UM1650
User manual

SPC56L-Discovery

Introduction

This document describes how to configure the board and how to setup the I/O communication.

Contents

1 SPC56L-Discovery 5

1.1 SPC56L-Discovery evaluation board 5

1.2 Debug interface 6

1.3 I/O interface and connectors 6

2 Hardware overview 7

2.1 12 VDC power supply adapter 7

2.2 +5 V and +3.3 V power supply sections 7

2.3 User LEDs 9

2.4 Reset 9

2.5 JTAG connector 10

2.6 High speed Nexus interface (Optional) 11

2.7 SPI Connector 12

2.8 High Speed CAN interface 13

2.9 UART / LIN 14

2.10 FlexRay 15

2.11 Potentiometers 16

2.12 I/O header 17

Appendix A General handling precautions 21

Revision history 22

List of tables

Table 1. SPC56L-Discovery board - JTAG connector (pin out) 11
Table 2. SPC56L-Discovery board - Nexus connector 12
Table 3. SPC56L-Discovery board - SPI connector (pin out) 13
Table 4. SPC56L-Discovery board - I/O header (Table, part 1) 18
Table 5. SPC56L-Discovery board - I/O header (Table, part 2) 19
Table 6. Document revision history 22

List of figures

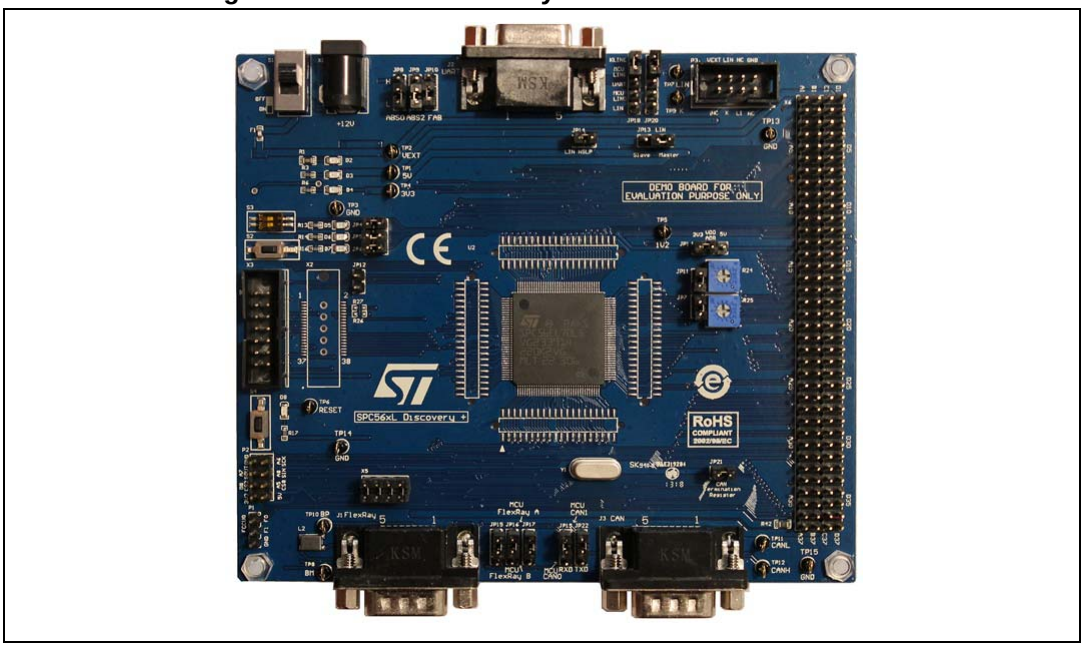
Figure 1. SPC56L-Discovery board with SPC56EL70L5 . . . 5
Figure 2. SPC56L-Discovery board – HW overview . . . 7
Figure 3. SPC56L-Discovery board - PSU Section . . . 8
Figure 4. SPC56L-Discovery board – PSU Section (3.3V) . . . 8
Figure 5. SPC56L-Discovery board - +12 VDC supply . . . 8
Figure 6. SPC56L-Discovery board – User LEDs . . . 9
Figure 7. SPC56L-Discovery board – Crystal (PCB) . . . 9
Figure 8. SPC56L-Discovery board – Reset (PCB) . . . 9
Figure 9. SPC56L-Discovery board – Reset (schematic) . . . 10
Figure 10. SPC56L-Discovery board - JTAG and Nexus connectors (PCB) . . . 10
Figure 11. SPC56L-Discovery board - JTAG connector (Schematic) . . . 10
Figure 12. SPC56L-Discovery board - Nexus connector (Schematic) . . . 11
Figure 13. SPC56L-Discovery board - SPI connector (PCB) . . . 12
Figure 14. SPC56L-Discovery board - SPI connector (Schematic) . . . 13
Figure 15. SPC56L-Discovery board - High Speed CAN interface (PCB) . . . 13
Figure 16. SPC56L-Discovery board - High Speed CAN interface (schematic) . . . 14
Figure 17. SPC56L-Discovery board - UART / LIN (PCB) . . . 14
Figure 18. SPC56L-Discovery board - UART / LIN (schematic) . . . 15
Figure 19. SPC56L-Discovery board - FlexRay (PCB) . . . 16
Figure 20. SPC56L-Discovery board - FlexRay (schematic) . . . 16
Figure 21. SPC56L-Discovery board - Potentiometers (PCB) . . . 16
Figure 22. SPC56L-Discovery board - Potentiometers (schematic) . . . 17
Figure 23. SPC56L-Discovery board - I/O header (schematic) . . . 17

1 SPC56L-Discovery

1.1 SPC56L-Discovery evaluation board

The SPC56L-Discovery kit is an evaluation tool supporting STMicroelectronics SPC56xL microcontrollers. The evaluation board allows full access to all of the CPUs I/O signals, and the peripherals such as CAN, FlexRay, UART, JTAG, K-Line, LIN.

Figure 1. SPC56L-Discovery board with SPC56EL70L5



The content of hardware of SPC56L-Discovery consists of:

- SPC56L-Discovery kit board (*Figure 1*).
- Power Supply (Mains: 90-240 V_{AC} - Output: 12 V_{DC}).

The SPC56xL family is ST state of the art MCU based on 32-bit microcontrollers Power Architecture® Cores specifically addressing all Automotive Applications but as well suitable for industrial safety oriented applications. The SPC56xL devices are optimized for chassis & safety applications and suitable for ASIL D/SIL level 3 requirements.

SPC56L-Discovery is supported by a specific Application Project inside SPC5Studio (a visual integrated software development environment to easily develop software for SPC56 MCU's), where micro start-up routine, I/O mapping and a simple test code has been already designed by STMicroelectronics experts. SPC5Studio is available for download www.st.com/spc5studio

SPC5Studio comes with HighTec GNU "C" compiler free fully featured trial 30 days trial version. An E2E Community is available on ST WEB: https://my.st.com/public/STe2ecommunities/mcu

The PCB, the components and all HW meet requirements of the applicable RoHS directives.

1.2 Debug interface

14 pin JTAG interface

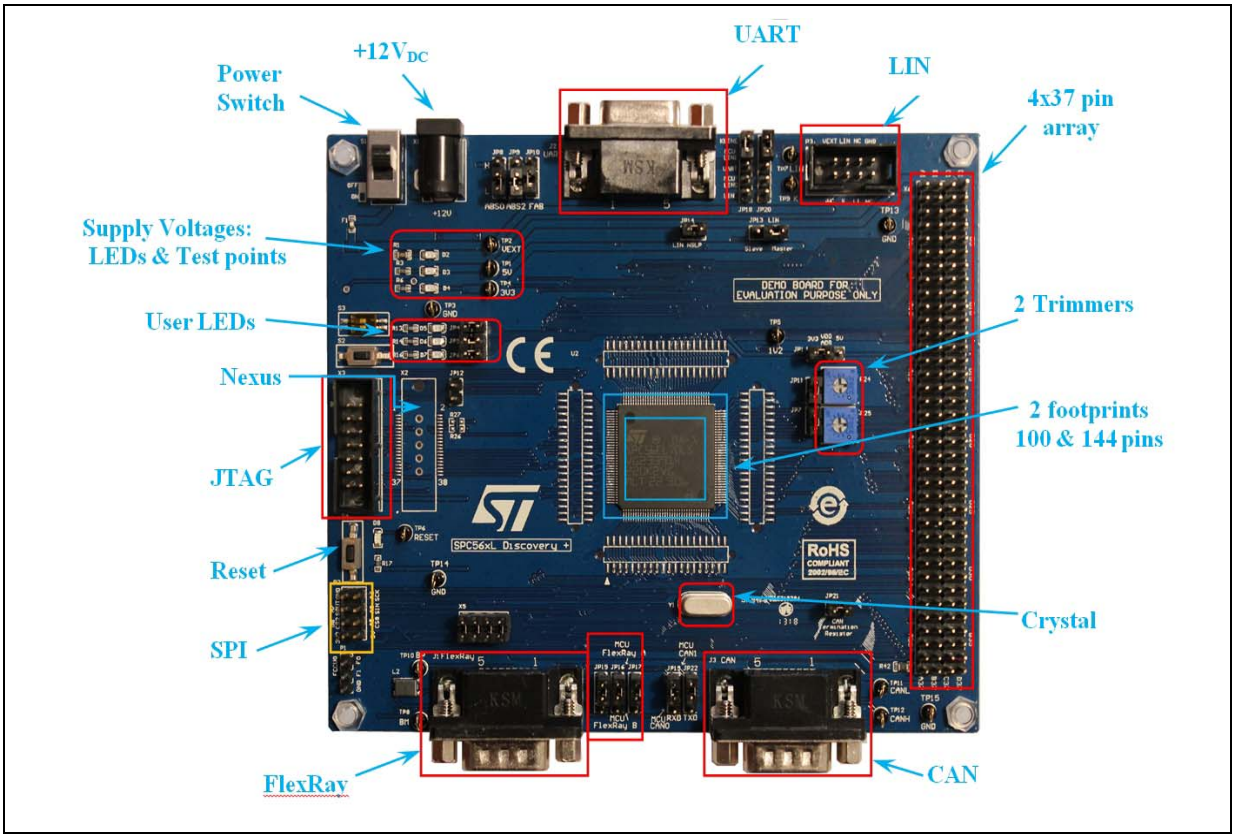
38 pin High speed Nexus interface (Optional)

1.3 I/O interface and connectors

- PSU plug (+12 V)
- UART (DB9-female)
- CAN interface (DB9-male)
- FlexRay (DB9-male)
- LIN
- K-Line
- 4 x 37 headers

2 Hardware overview

Figure 2. SPC56L-Discovery board – HW overview



2.1 12 V_{DC} power supply adapter

The 12 V_{DC} voltage is used to supply the whole board including the microcontroller and the communication interface transceiver chips. The power supply is included in the kit. The 12 V adapter can be supplied with mains 90÷240 V_{AC}; the AC plug is the standard CEE 7/16 Europlug. The PSU output barrel connector (+12 V_{DC}) is center positive power supply with 2.1/5.5 mm diameters.

2.2 +5 V and +3.3 V power supply sections

A dedicated DC-DC converter is used to generate +5 V_{DC}. A linear low dropout regulator is used to generate +3.3 V. The switch S1 is used to turn on and turn off the board. 3 LEDs (D2, D3 and D4) are connected to 12 V, +5 V and 3.3 V respectively.

Figure 3. SPC56L-Discovery board - PSU Section

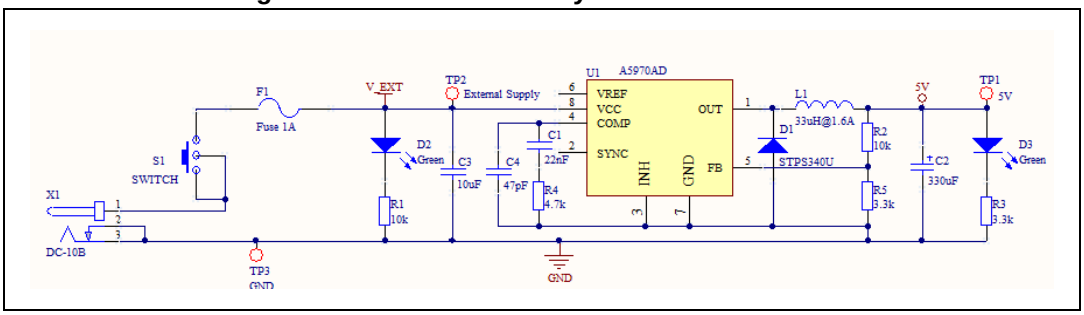
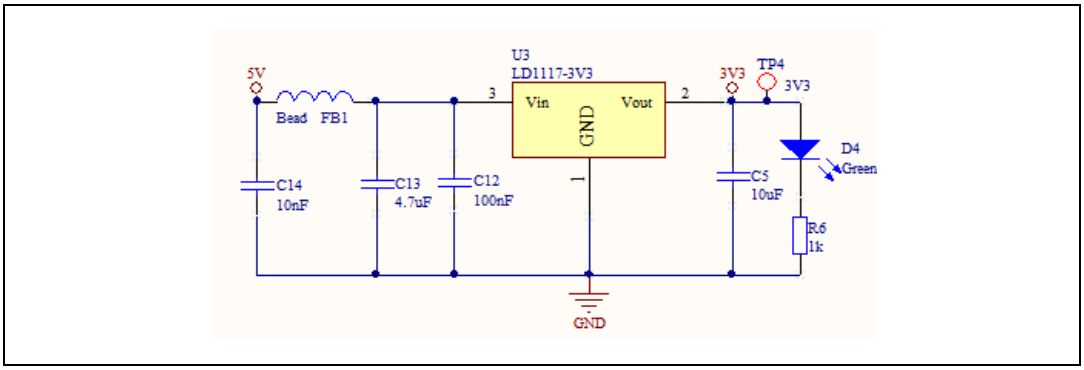
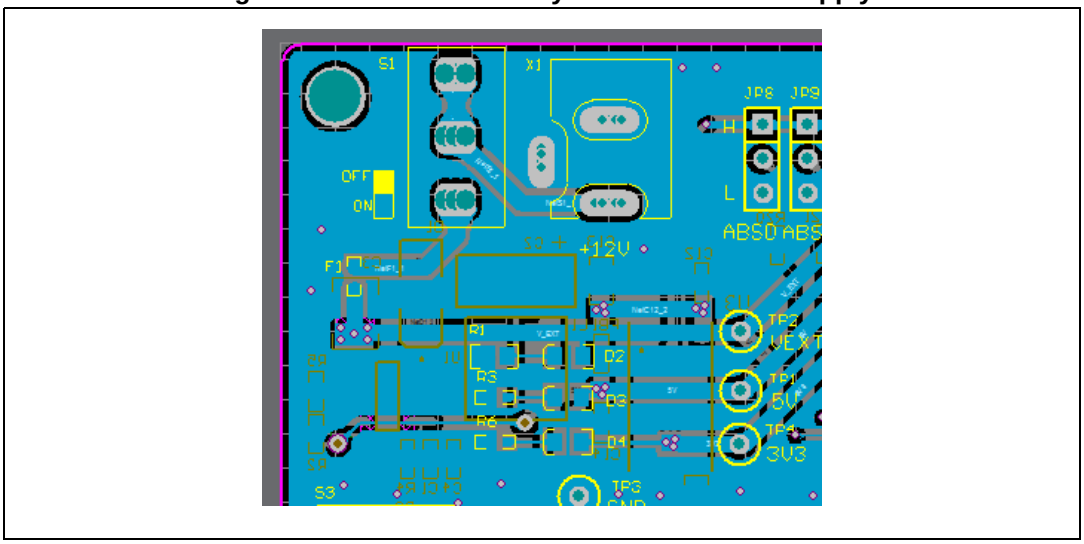


Figure 4. SPC56L-Discovery board – PSU Section (3.3V)



Three test points are available to measure the voltage levels: TP2=12V, TP1=5V, TP4=3V3 while TP3 is connected to GND F1 (1A) is a not resettable fuse.

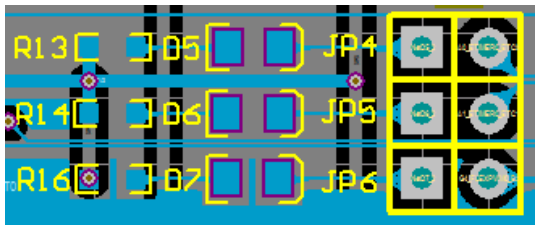
Figure 5. SPC56L-Discovery board - +12 VDC supply



2.3 User LEDs

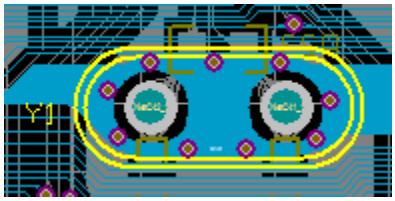
Three LEDs are available and can be configured by the user. The LEDs are D5, D6 and D7. Jumper JP4, JP5 and JP6 connect the LEDs to the microcontroller.

Figure 6. SPC56L-Discovery board – User LEDs



Y1 is a 40 MHz through-hole crystal. The crystal is plugged in a dedicated socket and it can be replaced without using a soldering station.

Figure 7. SPC56L-Discovery board – Crystal (PCB)



2.4 Reset

A reset section is present in the board. The resent signal is generated using the device STM6315RB when the button S4 is pushed; the LED D8 will be turned on when the reset pulse is generated.

Figure 8. SPC56L-Discovery board – Reset (PCB)

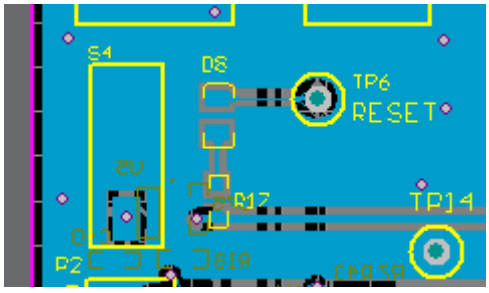
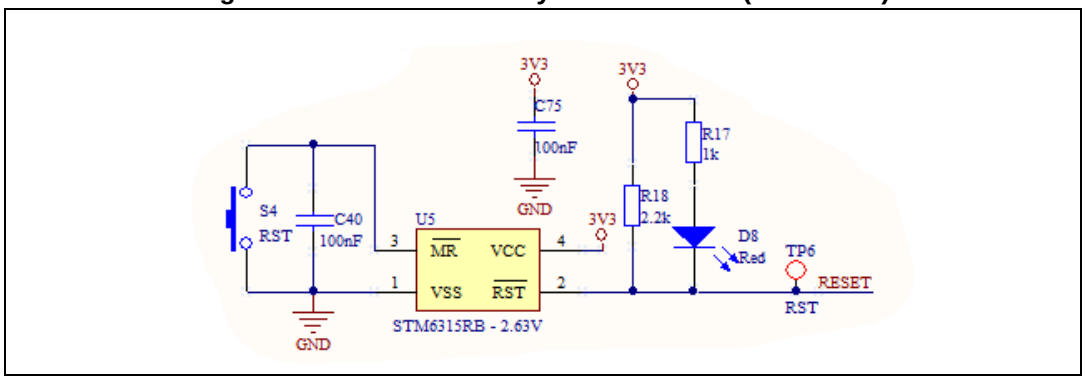


Figure 9. SPC56L-Discovery board – Reset (schematic)



2.5 JTAG connector

Figure 10. SPC56L-Discovery board - JTAG and Nexus connectors (PCB)

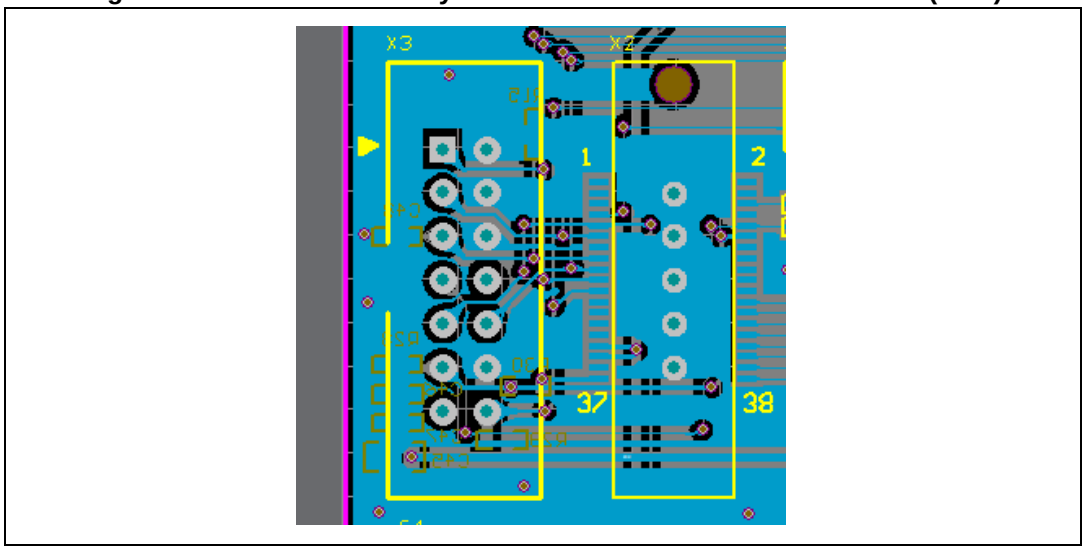


Figure 11. SPC56L-Discovery board - JTAG connector (Schematic)

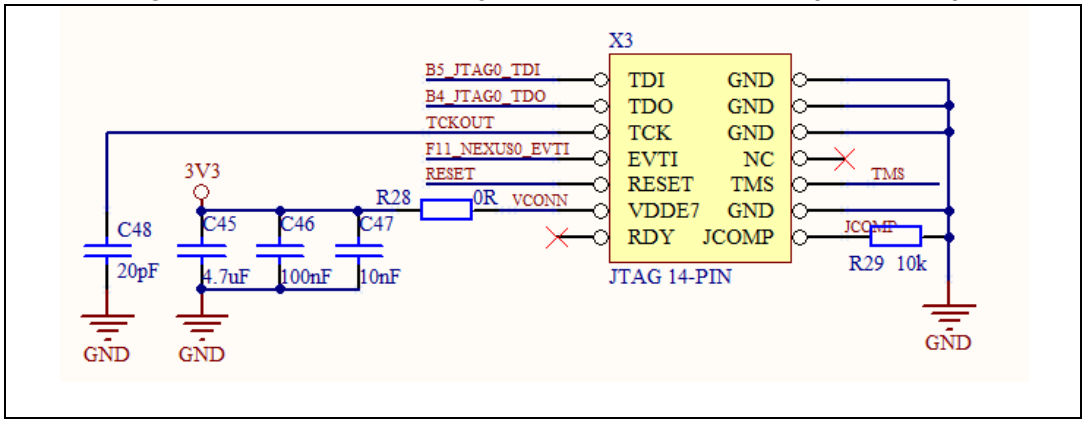
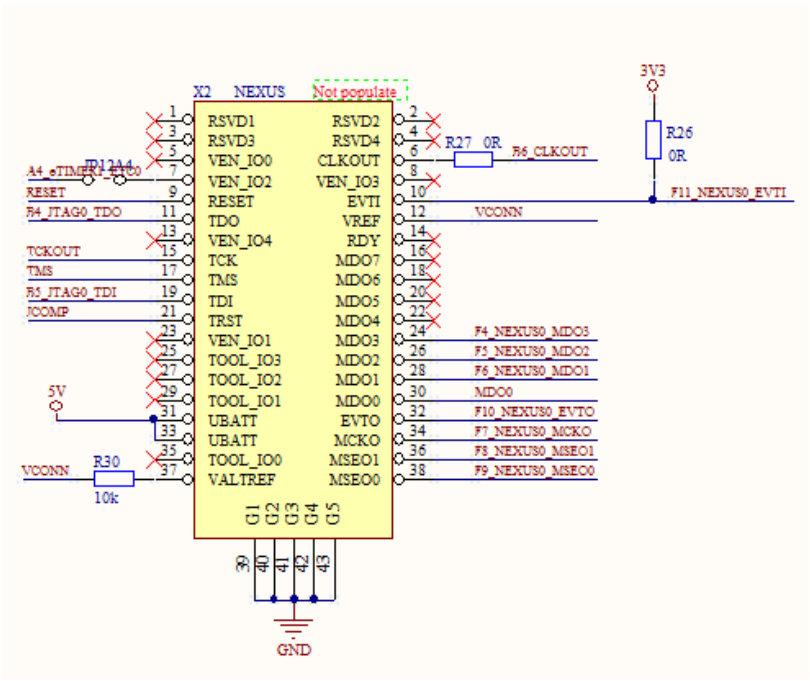


Table 1. SPC56L-Discovery board - JTAG connector (pin out)

Pin number	Pin name	Pin number	Pin name
1	TDI	2	GND
3	TDO	4	GND
5	TCK	6	GND
7	EVTI	8	NC
9	RESET	10	TMS
11	VDDE7	12	GND
13	RDY	14	JCOMP

Figure 12. SPC56L-Discovery board - Nexus connector (Schematic)



2.6 High speed Nexus interface (Optional)

Figure 12 shows connector for Nexus interface for high-end development tools; (the PCB is shown in *Figure 10*).

Table 2. SPC56L-Discovery board - Nexus connector

Pin number	Pin name	Pin number	Pin name
1	RSVD1	2	RSVD2
3	RSVD3	4	RSVD4
5	VEN_IO0	6	CLKOUT
7	VEN_IO2	8	VEN_IO3
9	RESET	10	EVTI
11	TDO	12	VREF
13	VEN_IO4	14	RDY
15	TCK	16	MDO7
17	TMS	18	MDO6
19	TDI	20	MDO5
21	TRST	22	MDO4
23	VEN_IO1	24	MDO3
25	TOOL_IO3	26	MDO2
27	TOOL_IO2	28	MDO1
29	TOOL_IO1	30	MDO0
31	UBATT	32	EVT0
33	UBATT	34	MCKO
35	TOOL_IO0	36	MSEO1
37	VALTREF	38	MSEO0

2.7 SPI Connector

Figure 13. SPC56L-Discovery board - SPI connector (PCB)

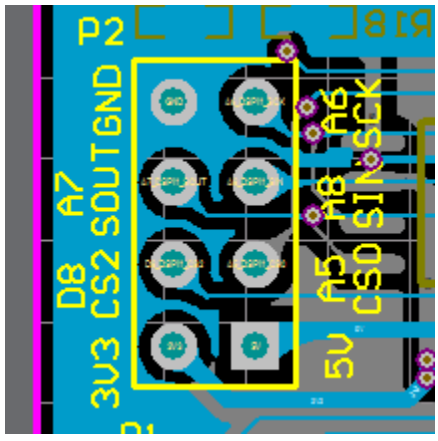


Figure 14. SPC56L-Discovery board - SPI connector (Schematic)

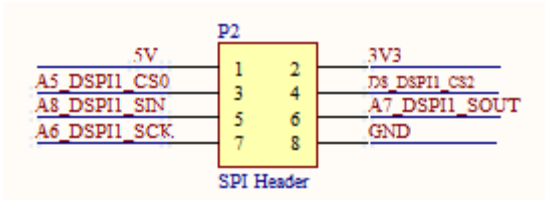


Table 3. SPC56L-Discovery board - SPI connector (pin out)

Pin number	Pin name	Pin number	Pin name
1	+5V	2	+3.3V
3	CSO	4	CS2
5	SIN	6	SOUT
7	SCK	8	GND

2.8 High Speed CAN interface

The CAN module is integrated in SPC56L-Discovery board; CAN transceiver is AMIS-30663 which support high-speed CAN.

Regarding the CAN connector, the two basic CAN channels are located in a DB9 male connector and they can be selected with a jumper option (JP19 and JP20).

Figure 15. SPC56L-Discovery board - High Speed CAN interface (PCB)

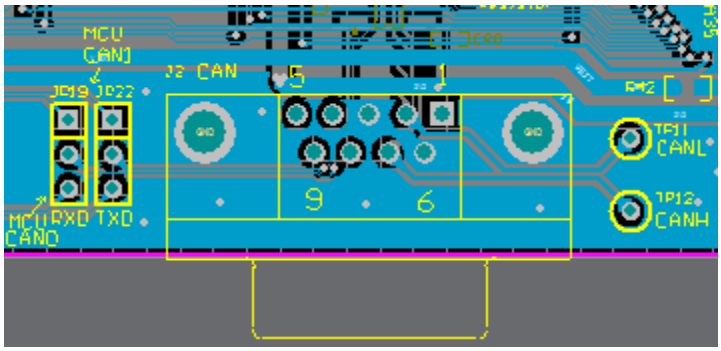
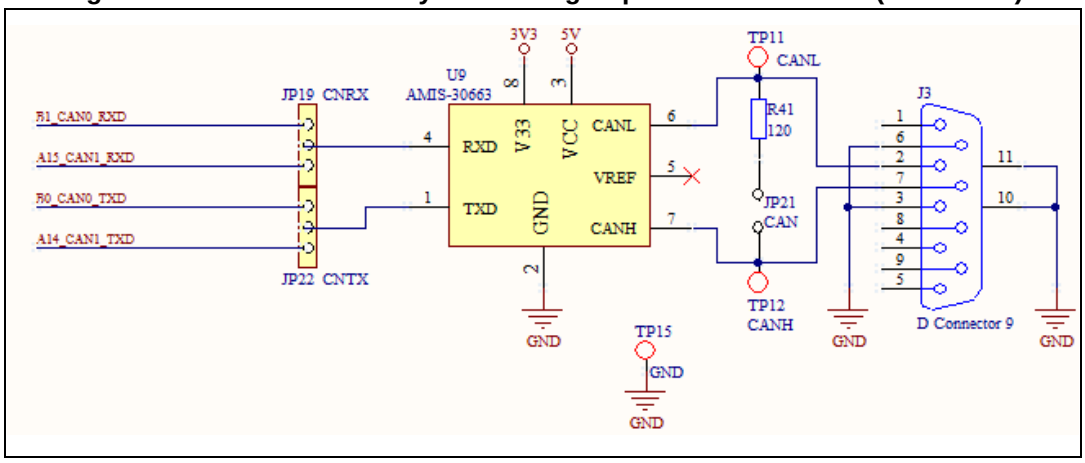


Figure 16. SPC56L-Discovery board - High Speed CAN interface (schematic)



Jumper JP21 is used to set proper 120 Ω termination resistor for CAN bus; disconnect this jumper if unnecessary.

TP11 and TP12 are connected to the CANL and CANH respectively (pin 2 and pin 7 of the DB9 connector J3).

2.9 UART / LIN

Figure 17 and *Figure 18* shows the hardware connection on evaluation board and the schematic diagram for the UART/LIN.

ST232 is the bridge between RS232 DB9 female interface and TX/RX signal of microcontroller; the L9637 is the ISO9141 interface chip.

In the microcontroller side, the user can set the JP18 and JP19 to configure UART or LIN.

Figure 17. SPC56L-Discovery board - UART / LIN (PCB)

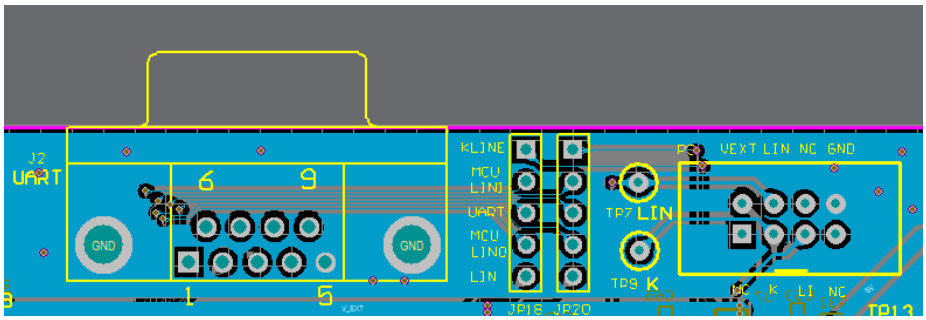
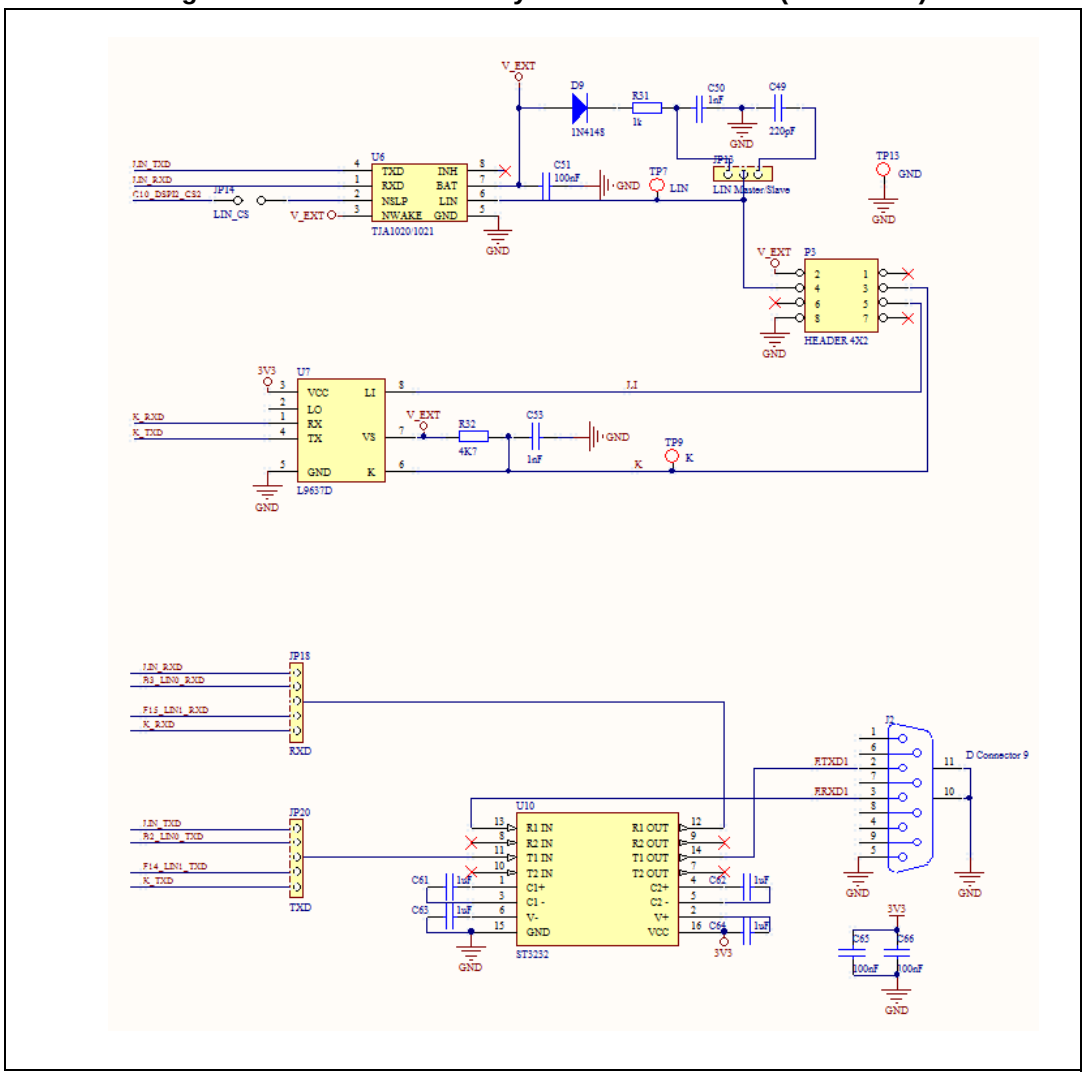


Figure 18. SPC56L-Discovery board - UART / LIN (schematic)



2.10 FlexRay

In the microcontroller side the user can configure the jumpers JP15, JP16 and JP7 allow to set channel A or B .

Figure 19. SPC56L-Discovery board - FlexRay (PCB)

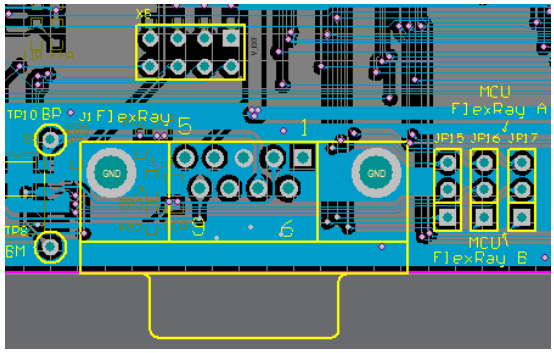
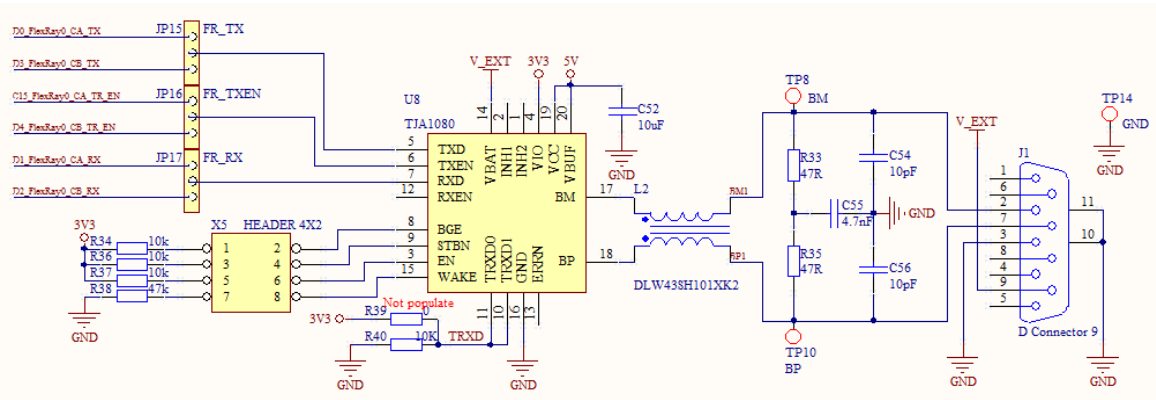


Figure 20. SPC56L-Discovery board - FlexRay (schematic)



2.11 Potentiometers

There are two potentiometers on the board which allow user to feed a range of voltage values into the ADC input to evaluate the performance of ADC.

The analog voltage level (0~VDD_HV_ADRV) can be monitored if the jumper JP7 and/or JP11 are inserted; the digital value can be read from microcontroller.

Figure 21. SPC56L-Discovery board - Potentiometers (PCB)

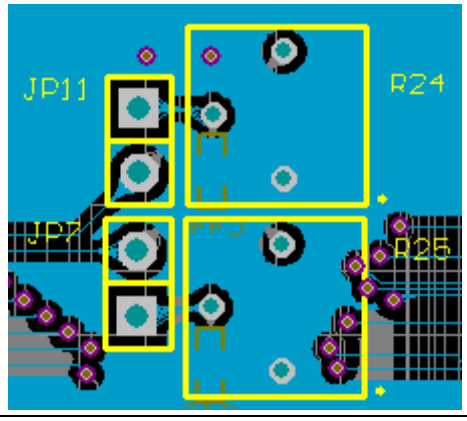
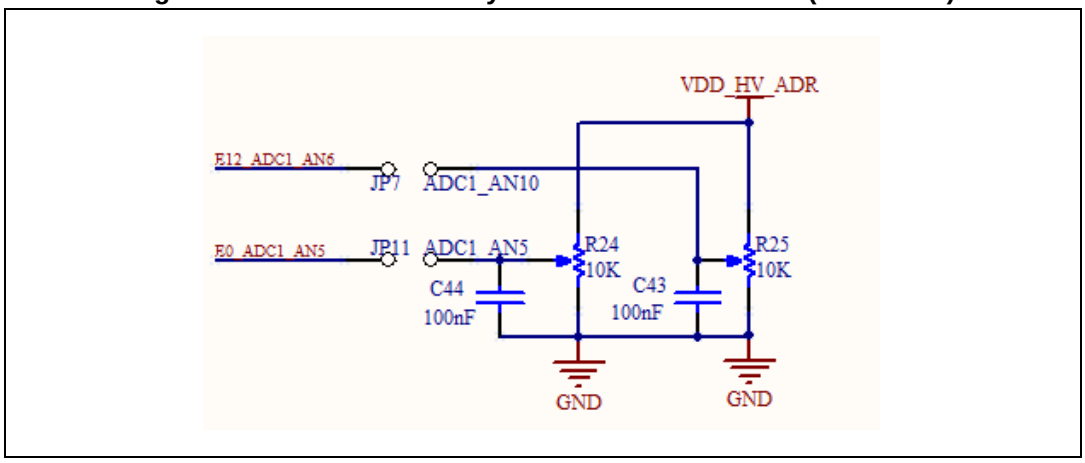


Figure 22. SPC56L-Discovery board - Potentiometers (schematic)



2.12 I/O header

The I/O microcontroller ins are connected to a 4x37 pin array (connector X6).

Figure 23. SPC56L-Discovery board - I/O header (schematic)

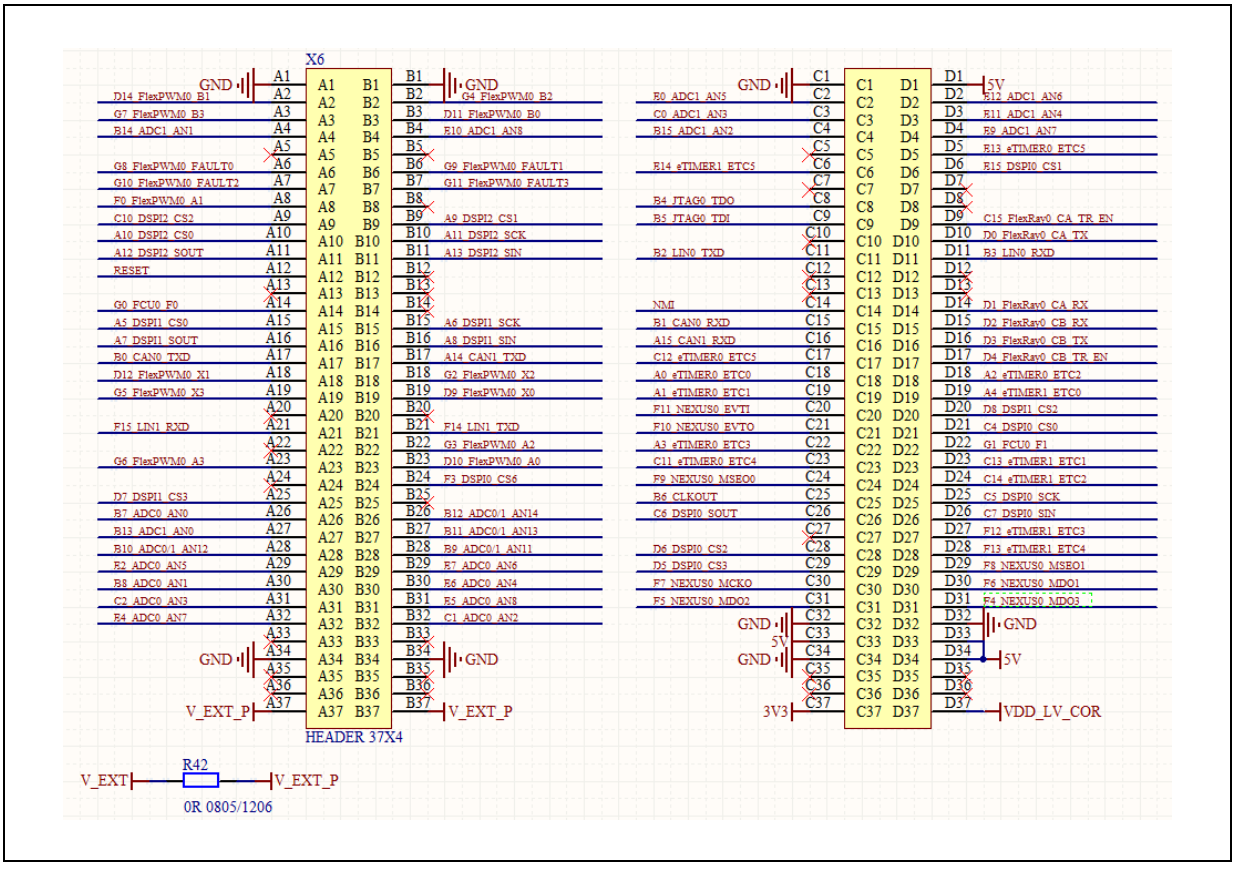


Table 4. SPC56L-Discovery board - I/O header (Table, part 1)

X6 Pin	Port	Description	X6 Pin	Port	Description
A1		GND	B1		GND
A2	D14	FlexPWM0_B1	B2	G4	FlexPWM0_B2
A3	G7	FlexPWM0_B3	B3	D11	FlexPWM0_B0
A4	B14	ADC1_AN1	B4	E10	ADC1_AN8
A5		NC	B5		NC
A6	G8	FlexPWM0_FAULT0	B6	G9	FlexPWM0_FAULT1
A7	G10	FlexPWM0_FAULT2	B7	G11	FlexPWM0_FAULT3
A8	F0	FlexPWM0_A1	B8		NC
A9	C10	DSPI2_CS2	B9	A9	DSPI2_CS1
A10	A10	DSPI2_CS0	B10	A11	DSPI2_SCK
A11	A12	DSPI2_SOUT	B11	A13	DSPI2_SIN
A12	RESET_B	RESET	B12		NC
A13		NC	B13		NC
A14	G0	FCU0_F0	B14		NC
A15	A5	DSPI1_CS0	B15	A6	DSPI1_SCK
A16	A7	DSPI1_SOUT	B16	A8	DSPI1_SIN
A17	B0	CAN0_TXD	B17	A14	CAN1_TXD
A18	D12	FlexPWM0_X1	B18	G2	FlexPWM0_X2
A19	G5	FlexPWM0_X3	B19	D9	FlexPWM0_X0
A20		NC	B20		NC
A21	F15	LIN1_RXD	B21	F14	LIN1_TXD
A22		NC	B22	G3	FlexPWM0_A2
A23	G6	FlexPWM0_A3	B23	D10	FlexPWM0_A0
A24		NC	B24	F3	DSPI0_CS6
A25	D7	DSPI1_CS3	B25		NC
A26	B7	DC0_AN0	B26	B12	ADC0/1_AN14
A27	B13	ADC1_AN0	B27	B11	ADC0/1_AN13
A28	B10	ADC0/1_AN12	B28	B9	ADC0/1_AN11
A29	E2	ADC0_AN5	B29	E7	ADC0_AN6
A30	B8	ADC0_AN1	B30	E6	ADC0_AN4
A31	C2	ADC0_AN3	B31	E5	ADC0_AN8
A32	E4	ADC0_AN7	B32	C1	ADC0_AN2
A33		NC	B33		NC

Table 4. SPC56L-Discovery board - I/O header (Table, part 1) (continued)

X6 Pin	Port	Description	X6 Pin	Port	Description
A34		GND	B34		GND
A35		NC	B35		NC
A36		NC	B36		NC
A37		V_EXT_P	B37		V_EXT_P

Table 5. SPC56L-Discovery board - I/O header (Table, part 2)

X6 Pin	Port	Description	X6 Pin	Port	Description
C1		GND	D1		5V
C2	E0	ADC1_AN5	D2	E12	ADC1_AN6
C3	C0	ADC1_AN3	D3	E11	ADC1_AN4
C4	B15	ADC1_AN2	D4	E9	ADC1_AN7
C5		NC	D5	E13	eTIMER0_ETC5
C6	E14	eTIMER1_ETC5	D6	E15	DSPI0_CS1
C7		NC	D7		NC
C8	B4	JTAG0_TDO	D8		NC
C9	B5	JTAG0_TDI	D9	C15	FlexRay0_CA_TR_EN
C10		NC	D10	D10	FlexRay0_CA_TX
C11	B2	LIN0_TXD	D11	B3	LIN0_RXD
C12		NC	D12		NC
C13		NC	D13		NC
C14		NMI	D14	D1	FlexRay0_CA_RX
C15	B1	CAN0_RXD	D15	D2	FlexRay0_CB_RX
C16	A15	CAN1_RXD	D16	D3	FlexRay0_CA_TX
C17	C12	eTIMER0_ETC5	D17	D4	FlexRay0_CB_TR_EN
C18	A0	eTIMER0_ETC0	D18	A2	eTIMER0_ETC2
C19	A1	eTIMER0_ETC1	D19	A4	eTIMER1_ETC0
C20	F11	NEXUS0_EVTI	D20	D8	DSPI1_CS2
C21	F10	NEXUS0_EVTO	D21	C4	DSPI1_CS0
C22	A3	eTIMER0_ETC3	D22	G1	FCU0_F1
C23	C11	eTIMER0_ETC4	D23	C13	eTIMER1_ETC1
C24	F9	NEXUS0_MSEO0	D24	C14	eTIMER1_ETC2
C25	B6	CLKOUT	D25	C5	DSPI0_SCK
C26	C6	DSPI0_SOUT	D26	C7	DSPI0_SIN

Table 5. SPC56L-Discovery board - I/O header (Table, part 2) (continued)

X6 Pin	Port	Description	X6 Pin	Port	Description
C27		NC	D27	F12	eTIMER1_ETC3
C28	D6	DSPI0_CS2	D28	F13	eTIMER1_ETC4
C29	D5	DSPI0_CS3	D29	F8	NEXUS0_MSEO1
C30	F7	NEXUS0_MCKO	D30	F6	NEXUS0_MDO1
C31	F5	NEXUS0_MDO2	D31	F4	NEXUS0_MDO3
C32		GND	D32		GND
C33		5V	D33		5V
C34		GND	D34		5V
C35		NC	D35		NC
C36		NC	D36		NC
C37		3V3	D37		VDD_LV_COR

Appendix A General handling precautions

The following precautions are recommended when using the SPC56EL70L5DISP, the PSU or the SPC56L-Discovery board:

- Do not modify or manipulate the board when the DC supply is connected to the board.
- Do not open and tamper the PSU. Use AC plug adaptor if the main socket is not compatible with the PSU.
- Do not supply the board with a DC source higher than 12 V.
- Any equipment or tool used for any manipulation of the semiconductor devices or board modification should be shielded and connected to ground.
- The connectors and cables should be plugged and removed when the board is off.
- It is suggested recommended to use antistatic tools.

Revision history

Table 6. Document revision history

Date	Revision	Changes
05-July-2013	1	Initial release.
05-Aug-2013	2	Update title. Update *Figure 1* and *Figure 2*. Replaced RPN *SPC56EL70L5DISP* with *SPC56L-Discovery*
17-Sep-2013	3	Updated Disclaimer.

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